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Demo: Exploring the Central Limit Theorem

In this video, we illustrate the Central Limit Theorem using the Sampling Distribution of Sample Means teaching module in the JMP Sample Data Index.

To start, we open the Sampling Distribution of Sample Means teaching module. To do this, we go to the Help menu and select Sample Data. Then, under the Teaching Resources outline, we open the Teaching Scripts outline, open the Interactive Teaching Modules outline, and click the link Sampling Distribution of Sample Means.

This teaching module enables you to sample data from a population with a specified mean and standard deviation. The default values are for IQ, the Intelligence Quotient. The population mean is 100, and the population standard deviation is 15.

The top graph displays the distribution of the population data, the middle graph shows the distribution of the current sample, and the bottom graph shows the distribution of sample means. We click Draw Additional Samples under Run Simulation to draw one sample at the default settings. This draws one random sample, of size 25, from the population.

You can see the distribution of the data for this one sample and the sample mean.

As we draw more samples, the sample means are collected here. We'll draw 1000 samples. Notice that the distribution of sample means is narrower than the distribution of the population, and it's centered at the population mean, 100.

Here are the mean and the standard deviation of the sample means. Notice that the standard deviation of sample means is much smaller than the standard deviation of the population. What does this distribution of sample means look like if we increase the sample size? As we increase the sample size, the distribution of sample means becomes tighter and tighter.

Now, what if the population distribution is not normal? For instance, what if the distribution is skewed? We'll select right-skewed and change the sample size to 10. Each sample is right-skewed, but notice the shape of the distribution of sample means. It's pretty close to normal and is again centered at the population mean.

Let's change the sample size to 25, and then 50, and then 100. As we increase the sample size, the distribution of sample means becomes more normal, and the standard deviation of the sample means becomes smaller and smaller.

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