Go to `http://www.stat.umn.edu/~arendahl/Teaching/Spring2008-STAT4102/hw2.html`.

The first applet takes samples from a standard normal distribution, and then builds a confidence interval for each sample. It records how many of the confidence intervals included (or captured) the true mean.

The simulation uses a population mean of 50 a standard deviation of 10, and a sample size of 100. The default confidence level is 68%.

What is the corresponding α? __________ What is the $z_{\alpha/2}$ value? __________

Click "sample!" and record the sample mean: ______ and confidence interval: ____________

Use the sample mean above to confirm that the confidence interval is correct; that is, compute the confidence interval, showing your work.

Does this confidence interval cover the true mean? ______

Now click "sample!" repeatedly until you have 50 samples.

How many didn't include the true mean? ____/50 = ______%

On average, what would you expect this percentage to be? ______%

Now change the confidence level to 95%. What are the new α and $z_{\alpha/2}$? ______ ______

How did the length of the confidence interval change? Explain why.

Which confidence level (68% or 95%) includes the true mean the most often? ____

So which do you want, a short interval, a high confidence level, or both? Explain why.

The second applet is similar, but allows you to change the sample size.
First, leave the defaults: $n = 100$, Normal Distribution, $\mu = 50$, and $\sigma = 10$.

Click "Simulate" to simulate 100 samples and confidence intervals from this distribution.

Explain what the colors green, blue, and red mean in the display.

How many of the 95% confidence intervals contained the mean? ______

How many would you expect to contain the mean, on average? ______

Compute the width of the 95% confidence intervals:

$$2 \times z_{\alpha/2} \frac{\sigma}{\sqrt{n}} = \_\_\_\_\_\_\_\_$$

Now change the sample size to 25, and compute the new width: ________.
Click "Simulate" a few times to get a good measure of how many contain the mean.

Now how many of the 95% confidence intervals contained the mean?

____/____ = ____%.

Explain how this happened even though the width of the intervals changed.

So, how does the sample size affect the width of the confidence interval?
Specifically, explain why you might want to increase the sample size.

In each of the following pairs, choose the one that is more correct. Explain why.

1. The confidence interval will include the true mean 95% of the time.
2. The true mean will be in the confidence interval 95% of the time.

1. The confidence interval I will create has a 95% probability of including the true mean.
2. The confidence interval I created has a 95% probability of including the true mean.

1. I am 95% confident that my confidence interval includes the true mean.
2. There is a 95% probability that my confidence interval includes the true mean.