**3. CI for mean and variance**

**CI for mean when σ is known:** $\overbar{x}\pm z\_{α/2}\frac{σ}{\sqrt{n}}$ **It is based on the statistic: z=** $\frac{(\overbar{x}-μ)}{{σ}/{\sqrt{n}}}$

**CI for the variance:** $\left(\frac{(n-1)S^{2}}{Chi\_{\frac{α}{2},n-1}^{2}}, \frac{(n-1)S^{2}}{Chi\_{1-\frac{α}{2},n-1}^{2}}\right)$ **It is based on the statistic:** $Chi\_{n-1}=\frac{(n-1)S^{2}}{σ^{2}}$

1. Suppose the weight W of a certain population of whales is known to be normally distributed with unknown mean and standard deviation of 500 pounds. The sample mean from a random sample of 16 whales was found to be 2350 pounds.
	1. Find the 90% confidence interval for the population mean.
	2. Find the weight B for which you can be 99% confident that B is an upper bound for the population mean.
2. A random variable X is known to be normally distributed with standard deviation 10. A random sample of size n was taken and the 92% confidence interval was found to be (8.5,13.5).
	1. What was the sample mean?
	2. What was the sample size?
3. A large population has a sample mean 100 and standard deviation 16.
	1. What is the probability that the mean will be within ±3 of the population mean if the sample size is n=100?
	2. What is the probability that the mean will be within ±3 of the population mean if the sample size is n=200?
	3. What is the advantage of a larger sample size?
4. Livestock are given a special feed supplement to see if it will promote weight gain. Researchers report that the 77 cows studied gained an average of 56 pounds, and that a 95% confidence interval for the mean weight gain has a margin of error 11 pounds. Some students wrote the following conclusions. Is anyone correct? Explain misinterpretations.
5. 95% of the cows studies gained between 45 and 67 pounds
6. We are 95% sure that a cow fed this supplement will gain between 45 and 67 pounds.
7. We are 95% sure that the average weight gain among the cows in this study was between 45 and 67 pounds.
8. The average weight gain of cows fed this supplement will be between 45 and 67 pounds, 95% of the time.
9. If this supplement is tested on another sample of cows, there is a 95% chance that their average weight gain will be between 45 and 67 pounds.
10. A random sample of size 13 is used to estimate the variance of a normal population X. The value of the sample variance is calculated to be 63. Find the 95% confidence interval for σ2 and σ.
11. A random sample of size 10 was taken from a normal population with standard deviation 41.67. Find the 2.5 percentile of the sample standard deviation.
12. You are given the following information from a random sample: (a) Xi is from a normal distribution with mean =1 and variance =2, (b) sample size = 20, (c) S2 is the unbiased sample variance. Calculate the critical value, c, which satisfies the equation P(S2<c)=.95.