**#3. CI for mean and variance**

1. $\overbar{x}=2350$, σ=500. φ
	1. $\overbar{x}\pm z\_{α/2}\frac{σ}{\sqrt{n}}$For 90% confidence, α/2=5%, so z.05=95th percentile=1.645 so we get the interval: 2350±(1.645)500/4
	2. The upper bound for 99% is: $\overbar{x}+z\_{α}\frac{σ}{\sqrt{n}}$ notice that the confidence level is α=1%. I don’t need to divide by 2 because I do not require a lower bound. (Here the question is what is m if P(µ<$\overbar{x}$+m)=.99. When you solve for m, you get m=$z\_{α}\frac{σ}{\sqrt{n}}$**).** The critical value z.01=99th percentile=2.326. So the upper bound is 2350+(2.326)500/4
2. Here the 92% confidence interval is (8.5,13.5). And σ=10.
	1. The center of the confidence interval is the sample mean: $\overbar{x}=\frac{(8.5+13.5)}{2}=11$
	2. The margin of error m=$z\_{α/2}\frac{σ}{\sqrt{n}}$is half the length of the interval (recall that the interval is ($\overbar{x}-m,\overbar{x}+m)$, this means the length of the interval is 2m). Length of interval=(13.5-8.5)=5. So m=2.5. For 92% confidence, α/2=4%, so z.04=96th percentile=1.75. Now we can solve for n in: m=$z\_{α/2}\frac{σ}{\sqrt{n}}$$2.5=\frac{(1.75)10}{\sqrt{n}}$ n=(17.5/2.5)2=49
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?

P(|$P\left(\left|\overbar{x}-μ\right|<3\right)= P\left(\frac{\left|\overbar{x}-μ\right|}{σ/\sqrt{n}}<\frac{3}{σ/\sqrt{n}}\right)=P\left(\left|Z\right|<\frac{3}{\frac{16}{\sqrt{100}}}\right)=$P(|Z|<1.875)=2φ(1.875)-1=2(.9695)-1=.9390

* 1. What is the probability that the mean will be within ±3 of the population mean if the sample size is n=200?

P(|$P\left(\left|\overbar{x}-μ\right|<3\right)= P\left(\frac{\left|\overbar{x}-μ\right|}{σ/\sqrt{n}}<\frac{3}{σ/\sqrt{n}}\right)=P\left(\left|Z\right|<\frac{3}{\frac{16}{\sqrt{200}}}\right)=$P(|Z|<2.65)= 2φ(2.65)-1=2(.996)-1=.992

* 1. What is the advantage of a larger sample size?

The larger the sample size, the higher the confidence.

1. Ans: (c) We are 95% sure that the **average** weight gain among the cows in this study was between 45 and 67 pounds.