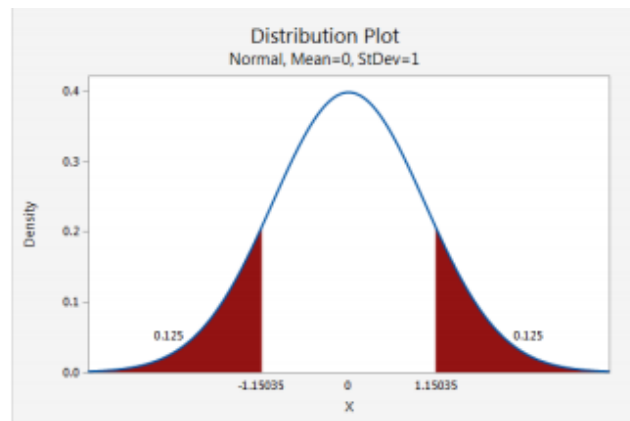


Chapter 16 – Confidence Intervals: The Basics

16.1 (a) The sampling distribution of \bar{x} has mean μ (unknown) and standard deviation $\frac{\sigma}{\sqrt{n}} = \frac{125}{\sqrt{170,100}} = 0.3031$. **(b)** According to this rule, 95% of all values of \bar{x} fall within 2 standard deviations of the sampling distribution of μ (that is, within $2(0.3031) = 0.6062$). **(c)** 285 ± 0.6062 , or between 284.3938 and 285.6062

16.5 Search Table A for 0.1250 (half of the 25% that is not included in the middle, shaded area corresponding to 75% confidence). This area corresponds to $-z^* = -1.15$, or $z^* = 1.15$.



16.6 STATE: What is the true conductivity of this iron rod? **PLAN:** We will estimate the true conductivity, μ (the mean of all measurements of its conductivity), by giving a 90% confidence interval. **SOLVE:** The statement of the problem in the text suggests that the conditions for inference should be satisfied. The mean of the sample is $\bar{x} = 10.08333$ microsiemens per centimeter. For 90% confidence, the critical value is $z^* = 1.645$. A 90% confidence interval for μ is

$$\bar{x} \pm z^* \frac{\sigma}{\sqrt{n}} = 10.08333 \pm 1.645 \frac{0.1}{\sqrt{6}} = 10.08333 \pm 0.06716 = 10.01617 \text{ to } 10.15049$$

microsiemens per centimeter. **CONCLUDE:** We are 90% confident that the iron rod's true connectivity is between 10.0162 and 10.1505 microsiemens per centimeter.

16.11 (c) $z = 3.291$. Using Table A, search for 0.9995.

16.12 (a) The standard deviation of \bar{x} is $\frac{\sigma}{\sqrt{n}} = \frac{0.001}{\sqrt{3}} = 0.000577$ gram, so the margin of error is $1.96 \frac{\sigma}{\sqrt{n}} = 1.96(0.000577) = 0.00113$ gram.

16.13 (b) As the confidence level increases, z^* increases. This makes the margin of error larger.

16.14 (c) The margin of error is now $\frac{(2.576)(0.001)}{\sqrt{8}} = 0.00091$.

16.15 (b) The standard deviation of \bar{x} is $\frac{\sigma}{\sqrt{n}} = \frac{125}{\sqrt{900}} = 4.167$.

16.16 (b) The margin of error is $1.960(4.167) = 8.167$, so the confidence interval is 288 ± 8.17 .

16.17 (b) As the confidence level increases, z^* increases. This makes the margin of error larger.

16.18 (a) The larger the sample size, the smaller the margin of error, provided that the confidence level and population standard deviation remain the same.

16.19 (a) We use $\bar{x} \pm z^* \frac{\sigma}{\sqrt{n}}$, or $15.3 \pm 2.576 \frac{8.5}{\sqrt{463}} = 15.3 \pm 1.018 = 14.282$ to 16.318

hours. (b) The 463 students in this class must be a random sample of all of the first-year students at this university to satisfy conditions for inference.