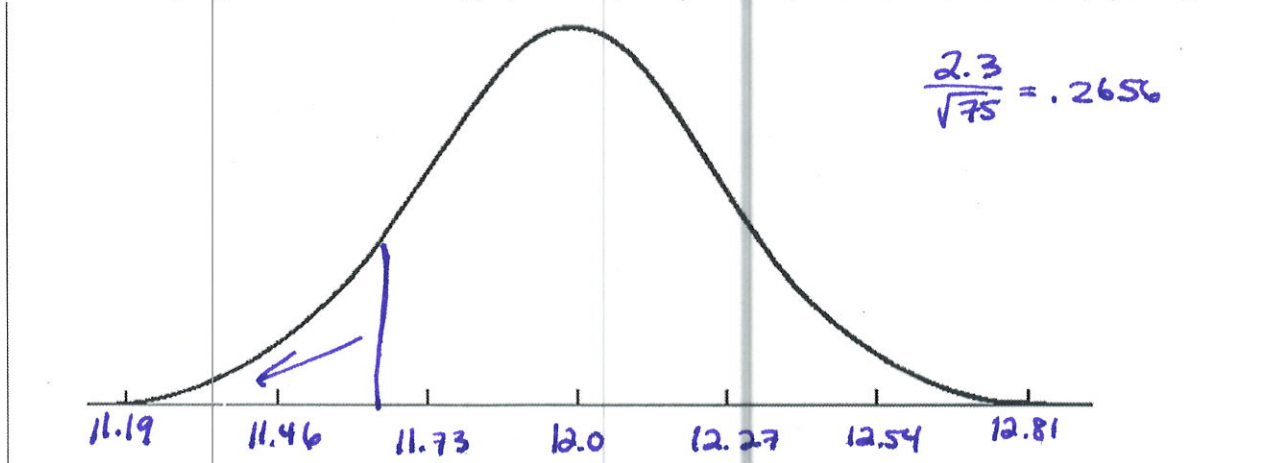


Instructions: Show all work. Use exact answers unless specifically asked to round. Explain thoroughly using complete sentences. If you use your calculator to perform statistical tasks, say which command/operations you are using and what you entered into your calculator, and what you got back to show work. If you do not show work and the answer is incorrect, no credit will be awarded.

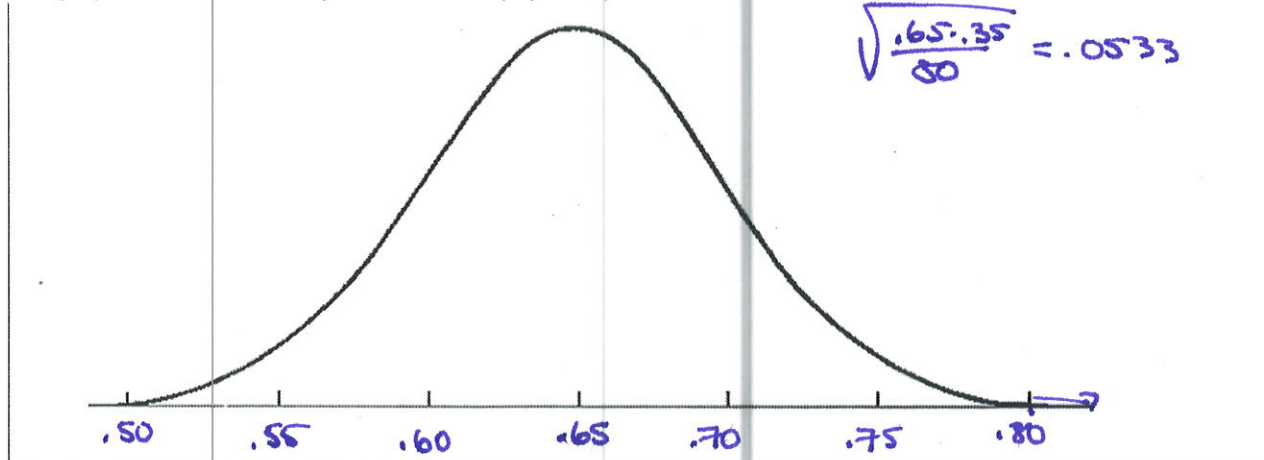
1. Draw the sampling distribution on the graph below with $\mu = 12.0$, $\sigma = 2.3$ when $n = 75$. (7 points)



What is the probability that the mean of a sample from this distribution will be less than 11.5?

$$\text{normalcdf}(-E99, 11.5, 12, .2656) = .02988$$

2. The population being sampled has a proportion of $p = 0.65$. Draw the sampling distribution on the graph below for a sample of $n = 80$. (8 points)



What is the probability that a sample of that size having a proportion greater than 80%?

$$\text{normalcdf}(.8, E99, .65, .0533) = .0024$$

3. The mean number of pets per student for a random sample of 47 students is 2.5 pets. If the standard deviation for the sample is 1.1 pets, find the confidence interval for the sample. (6 points)

T-Interval Stats

$$\bar{x} = 2.5$$

$$s_x = 1.1$$

$$n = 47$$

$$C\text{-level} = .95$$

$$(2.177, 2.823)$$

4. If the sample above was reduced to 30 students, how does that affect the confidence interval? (3 points)

it will get wider

$$(2.0893, 2.9107)$$

5. Find the t-distribution values with the indicated properties. (3 points each).

a. $P(t > 1.36, df = 4)$

$$t_{cdf}(1.36, E99, 4) = .1227$$

b. $P(t < -0.83, df = 11)$

$$t_{cdf}(-E99, -.83, 11) = .2121$$

- c. If we are using a t-distribution curve with $df = 21$, and the probability associated with it is 0.1173, what is the value of t that corresponds to this probability?

$$\text{invT}(.1173, 21) = -1.2238$$

6. If you want to calculate the mean height of women to 0.1 inches, knowing the standard deviation of the population is 3.1 inches, with 95% confidence, how large a sample size is needed? (5 points)

$$MqE = \frac{z_{\alpha/2} \sigma}{\sqrt{n}} \Rightarrow \sqrt{n} = \frac{z \sigma}{MqE}$$

$$n = \frac{z^2 \sigma^2}{(MqE)^2} = 3691.77$$

$$\boxed{n = 3692}$$

7. Find the 80% confidence interval for defective chips for a sample of 200 computer chips if the defective rate of those chips is 4%. (5 points)

1 Prop Z Int (.02224, .05776)

$x = .04 * 200 = 8$

$n = 200$

C-level: .8

8. If we wanted to calculate a 99% confidence interval with the margin of error being 1%, what is the sample size that would be needed in the above scenario? (5 points)

$$n = p(1-p) \frac{z^2}{E^2} \quad n = 2537$$

$$.04 + .96 \left(\frac{2.57}{.01} \right)^2 = 2536.28...$$

9. A teacher believes students learning math in elementary school do better when they use physical learning aids to understand concepts. She conducts a study to test her beliefs. (6 points)
- a. Describe a Type I error in the context of this study.

The learning aids do not make a difference but you conclude that they do.

- b. Describe a Type II error in the context of this study?

The learning aids make a difference but you conclude they do not.

10. A study is conducted and a P-value of 0.02 is found. What does this mean? Does your interpretation change if the α -level is 0.01? (5 points)

The p-value means there is a 2% chance that the results of the sample were obtained from the assumed population purely by chance. The significance level of 0.01 just means that this result is not unlikely enough to reject our initial assumptions.