

## Chapter 10: Estimating with Confidence



### Key Vocabulary:

- confidence interval
- margin of error
- interval
- confidence level
- a level  $C$  confidence interval
- degrees of freedom
- standard error
- $t$  distribution
- one-sample  $t$  statistic
- robust
- power
- upper  $p$  critical value
- $p$ -value
- acceptance sampling
- statistically significant
- significance level

### Calculator Skills:



- ZInterval
- TInterval
- $\text{tpdf}(X, \text{df})$
- $\text{normalpdf}(X)$

### 10.1 Confidence Intervals: The Basics (pp.615-643)

1. In statistics, what is meant by a *95% confidence interval*?
2. A confidence interval takes the form of : “**estimate  $\pm$  margin of error**”  
where: estimate =  
margin of error =
3. Define a *level  $C$  confidence interval*.
4. Sketch and label a *95% confidence interval* for the standard normal curve.

5. In a sampling distribution of  $\bar{x}$ , why is the interval of numbers between  $\bar{x} \pm 2s$  called a *95% confidence interval*?
  
6. Sketch and label a *90% confidence interval* for the standard normal curve.
  
  
  
  
  
  
  
7. State the three **conditions for constructing a confidence interval** for  $\mu$ .
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8. What does  $z^*$  represent?
  
9. What is the value of  $z^*$  for a *95% confidence interval*? Include a sketch.
  
  
  
  
  
  
  
  
  
  
10. What is the value of  $z^*$  for a *90% confidence interval*? Include a sketch.
  
  
  
  
  
  
  
  
  
  
11. What is the value of  $z^*$  for a *99% confidence interval*? Include a sketch.
  
  
  
  
  
  
  
  
  
  
12. What is meant by the *upper  $p$  critical value* of the standard normal distribution?
  
  
  
  
  
  
  
  
  
  
13. Explain how to find a *level  $C$  confidence interval* for an SRS of size  $n$  having unknown mean  $\mu$  and known standard deviation  $\sigma$ .

14. Use of the “Inference Toolbox” is extremely important when using inference. Summarize the four steps of the inference toolbox.

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15. Why is it best to have high *confidence* and a small *margin of error*?

16. What happens to the *margin of error* as  $z^*$  gets smaller? Does this result in a higher or lower confidence level?

17. What happens to the *margin of error* as  $\sigma$  gets smaller?

18. What happens to the *margin of error* as  $n$  gets larger? By how many times must the sample size  $n$  increase in order to cut the *margin of error* in half?

19. The formula used to determine the sample size  $n$  that will yield a confidence interval for a population mean with a specified margin of error  $m$  is  $z^* \frac{\sigma}{\sqrt{n}} \leq m$ . Solve for  $n$ .

## 10.2 Estimating a Population Mean (pp.642-662)

1. Under what conditions can we use  $s$  as a reasonable estimate of  $\sigma$ ?
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2. In general, what is meant by the *standard error* of a statistic?
3. How does the *standard deviation* differ to of the sample mean  $\bar{x}$ ?
4. What is the *standard error* of the sample mean  $\bar{x}$ ?
5. How do you calculate the *degrees of freedom* for a *t distribution*?
6. Describe the similarities between a *standard normal distribution* and a *t distribution*.
7. Describe the differences between a *standard normal distribution* and a *t distribution*.
8. What happens to the *t distribution* as the *degrees of freedom* increase?
9. How would you construct a level  $C$  confidence interval for  $\mu$  if  $\sigma$  is unknown?

10. In a matched pairs *t procedure*, what is  $\mu$ , the parameter of interest?

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11. What does it mean if an inference procedure is **robust**?

12. If the size of the SRS is less than 15, when can we use *t procedures* on the data?

13. If the size of the SRS is at least 15, when can we use *t procedures* on the data?

14. If the size of the SRS is at least 30, when can we use *t procedures* on the data?

### 10.3 Estimating a Population Proportion (pp.663-683)

1. In statistics, what is meant by a *sample proportion*:  $\hat{p}$  ?
2. Give the mean and standard deviation for the sampling distribution of  $\hat{p}$  ?
3. How does the standard deviation differ to to standard error for the sampling distribution of  $\hat{p}$  ?
4. How do you calculate the standard error of  $\hat{p}$  ?
5. What conditions must be met in order to use *z procedures* for inference about a proportion?
6. Describe how to construct a level C confidence interval for a population proportion.
7. What formula is used to determine the sample size necessary for a given margin of error?