

7. {1.1, 1.3, 1.5, 2.20, 3.30abc, 3.33c, 3.37a}, 8. { 1.4abc, 2.21ab, 2.25, 4.44ab, 4.45}

7.1.1 Consider a normal population distribution with the value of σ known.

- (a) What is the confidence level for the interval $\bar{x} \pm 2.81\sigma / \sqrt{n}$?
- (b) What is the confidence level for the interval $\bar{x} \pm 1.44\sigma / \sqrt{n}$?
- (c) What value of $z_{\alpha/2}$ in the CI formula (7.5) results in a confidence level of 99.7%?
- (d) Answer the question posed in part (c) for a confidence level of 75%.

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7.1.3 Suppose that a random sample of 50 bottles of a particular brand of cough syrup is selected and the alcohol content of each bottle is determined. Let μ denote the average alcohol content for the population of all bottles of the brand under study. Suppose that the resulting 95% confidence interval is (7.8, 9.4).

- (a) Would a 90% confidence interval calculated from this same sample have been narrower or wider than the given interval? Explain your reasoning.
- (b) Consider the following statement: There is a 95% chance that μ is between 7.8 and 9.4. Is this statement correct? Why or why not?
- (c) Consider the following statement: We can be highly confident that 95% of all bottles of this type of cough syrup have an alcohol content that is between 7.8 and 9.4. Is this statement correct? Why or why not?
- (d) Consider the following statement: If the process of selecting a sample of size 50 and then computing the corresponding 95% interval is repeated 100 times, 95 of the resulting intervals will include μ . Is this statement correct? Why or why not?

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7.1.5 Assume that the helium porosity (in percentage) of coal samples taken from any particular seam is normally distributed with true standard deviation .75.

- (a) Compute a 95% CI for the true average porosity of a certain seam if the average porosity for 20 specimens from the seam was 4.85.
- (b) Compute a 98% CI for true average porosity of another seam based on 16 specimens with a sample average porosity of 4.56.
- (c) How large a sample size is necessary if the width of the 95% interval is to be .40?
- (d) What sample size is necessary to estimate true average porosity to within .2 with 99% confidence?

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7.2.20 TV advertising agencies face increasing challenges in reaching audience members because viewing TV programs via digital streaming is gaining in popularity. The **Harris poll** reported on November 13, 2012, that 53% of 2343 American adults surveyed said they have watched digitally streamed TV programming on some type of device.

- (a) Calculate and interpret a confidence interval at the 99% confidence level for the proportion of all adult Americans who watched streamed programming up to that point in time.
- (b) What sample size would be required for the width of a 99% CI to be at most .05 irrespective of the value of \hat{p} ?

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7.3.30abc Determine the t critical value for a two-sided confidence interval in each of the following situations:

- (a) Confidence level = 95%, $df = 10$
- (b) Confidence level = 95%, $df = 15$
- (c) Confidence level = 99%, $df = 10$

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7.3.33c The article "**Measuring and Understanding the Aging of Kraft Insulating Paper in Power Transformers**" (*IEEE Electrical Insul. Mag.*, 1996: 28–34) contained the following observations on degree of polymerization for paper specimens for which viscosity times concentration fell in a certain middle range:

418	421	421	434	437	439	454
463	465	422	425	427	431	446
447	448	453				

(c) Calculate a two-sided 95% confidence interval for true average degree of polymerization (as did the authors of the article). Does the interval suggest that 440 is a plausible value for true average degree of polymerization? What about 450?

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7.3.37a TA study of the ability of individuals to walk in a straight line ("**Can We Really Walk Straight?**" *Amer. J. of Physical Anthro.*, 1992: 19?27) reported the accompanying data on cadence (strides per second) for a sample of n 5 20 randomly selected healthy men.

.95 .85 .92 .95 .93 .86 1.00 .92 .85 .81
.78 .93 .93 1.05 .93 1.06 1.06 .96 .81 .96

A normal probability plot gives substantial support to the assumption that the population distribution of cadence is approximately normal. A descriptive summary of the data from Minitab follows:

Variable	N	Mean	Median	TrMean	StDev	SEMean
cadence	20	0.9255	0.9300	0.9261	0.0809	0.0181
Variable	Min	Max	Q1	Q3		
cadence	0.7800	1.0600	0.8525	0.9600		

(a) Calculate and interpret a 95% confidence interval for population mean cadence.

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8.1.4abc Pairs of P -values and significance levels, α , are given. For each pair, state whether the observed P -value would lead to rejection of H_0 at the given significance level.

(a) P -value = .084, α = .05

(b) P -value = .003, α = .001

(c) P -value = .498, α = .05

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8.2.21ab The desired percentage of SiO_2 in a certain type of aluminous cement is 5.5. To test whether the true average percentage is 5.5 for a particular production facility, 16 independently obtained samples are analyzed. Suppose that the percentage of SiO_2 in a sample is normally distributed with $\sigma = .3$ and that $\bar{x} = 5.25$.

- (a) Does this indicate conclusively that the true average percentage differs from 5.5?
- (b) If the true average percentage is $\mu = 5.6$ and a level $\alpha = .01$ test based on $n = 16$ is used, what is the probability of detecting this departure from H_0 ?

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8.2.25 Body armor provides critical protection for law enforcement personnel, but it does affect balance and mobility. The article "**Impact of Police Body Armour and Equipment on Mobility**" (*Applied Ergonomics*, 2013: 957–961) reported that for a sample of 52 male enforcement officers who underwent an acceleration task that simulated exiting a vehicle while wearing armor, the sample mean was 1.95 sec, and the sample standard deviation was .20 sec. Does it appear that true average task time is less than 2 sec? Carry out a test of appropriate hypotheses using a significance level of .01.

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8.4.44ab A manufacturer of nickel-hydrogen batteries randomly selects 100 nickel plates for test cells, cycles them a specified number of times, and determines that 14 of the plates have blistered.

- (a) Does this provide compelling evidence for concluding that more than 10% of all plates blister under such circumstances? State and test the appropriate hypotheses using a significance level of .05. In reaching your conclusion, what type of error might you have committed?
- (b) If it is really the case that 15% of all plates blister under these circumstances and a sample size of 100 is used, how likely is it that the null hypothesis of part (a) will not be rejected by the level .05 test? Answer this question for a sample size of 200.

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8.4.45 A random sample of 150 recent donations at a certain blood bank reveals that 82 were type A blood. Does this suggest that the actual percentage of type A donations differs from 40%, the percentage of the population having type A blood? Carry out a test of the appropriate hypotheses using a significance level of .01. Would your conclusion have been different if a significance level of .05 had been used?

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