

1. Use your calculator to construct a Normal Quantile Plot for the following data. Determine whether the data come from a normally distributed population.

2.01 2.74 2.03 2.82 2.52 2.71 3.07 2.43 3.28 3.03

The the Normal Quantile Plot, the points lie roughly on a straight line without a systematic pattern. Therefore, the data come from a normal distribution.

2. After the Bigtown Fugitive Task Force displays photos of 99 fugitives in the local newspaper, the police arrest 17 of them.

- (a). Construct an 85% confidence interval estimate of the proportion of fugitives arrested after their photo was displayed.
 $.12 < p < .23$
- (b). Based on your confidence interval, what can you say about the Task Force's claim that the method of displaying photos results in arresting a quarter of the fugitives.
 Since .25 is not in the CI, this claim is not justified.

3. When people smoke, the nicotine they absorb is converted to cotinine, which can be measured. A sample of 40 smokers has a mean cotinine level of 172.5. Assuming σ is known to be 119.5, find a 90% confidence interval estimate of the mean cotinine level of all smokers.
 $141.4 < \mu < 203.6$

4. Nielsen Media Research wants to estimate the mean amount of time (in minutes) that full-time college students spend watching tv each weekday. A pilot study showed that the standard deviation is 112.2 minutes. Find the sample size necessary to estimate that mean with a 15-minute margin of error. Assume that a 96% confidence level is desired.
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5. A confidence interval for a population mean is to be estimated. For each problem, decide whether to use z or t or state that neither the normal nor the t -distribution applies.

- (a). 95%; $n = 10$; σ is unknown; population appears to be normally distributed. t -distribution
- (b). 95%; $n = 32$; σ is unknown; population appears to be skewed. t -distribution
- (c). 99%; $n = 15$; σ is known; population appears to be normally distributed. normal distribution (i.e. z)
- (d). 99%; $n = 15$; σ is unknown; population appears to be very skewed. neither

6. A random sample of 12 East Coast colleges and universities gave the following percentage tuition increases for a given 2-year period. Compute a 90% confidence interval for the population mean percentage tuition increase μ . Assume that the population is approximately normally distributed.
 $3.67\% < \mu < 5.73\%$

3.9 2.3 3.7 9.4 4.8 3.9 6.7 6.6 4.6 4.3 3.1 3.1

7. Use the following information to construct a confidence interval estimate for the standard deviation σ :
 95% confidence, $n = 16$, $\bar{x} = 16$, $s = 1.56$

$$1.15 < \sigma < 2.41$$

8. For the given claim, express the null hypothesis and alternative hypothesis in symbolic form. Be sure to use the correct symbol (p , μ , σ) for the indicated parameter.

The majority of college students have a laptop.

$$H_0 : p = 0.50; H_1 : p > 0.50$$

9. Assume that the normal distribution applies and find the critical z value(s) for $\alpha = 0.01$ and $H_1 : p < 0.36$. $z_{crit} = -2.33$

10. The claim is that more than 64% of households in the United States have more than one car. A survey of 1023 households found that 604 have more than one car. Find the test statistic for the population proportion. $z = -3.30$

11. If the test statistic in a two-tailed test is $z = 1.81$

(a). Find the P -value. $P\text{-value} = 0.0702$

(b). Using a significance level of $\alpha = 0.05$ determine whether you would reject the null hypothesis or fail to reject the null hypothesis. Fail to reject H_0 .

12. Suppose you want to open your own music store. You learn from research that the mean start-up costs (across the entire country) for such a business is \$61,400. You are planning to open your store in Idaho and would like to compare the costs. You randomly select 34 music stores in Idaho and find that this sample has a mean start-up cost of \$55,200 and standard deviation of \$18,800. Use a 0.05 significance level to determine whether population mean start-up costs in Idaho are lower than the national average. Use the traditional method and the P -value method. $H_0 : \mu = 61,400$; $H_1 : \mu < 61,400$;

Test statistic: $t = -1.923$; Critical value: $t = -1.692$. Range of P -values: $.025 < P\text{-value} < .05$ (tech: $P\text{-value} = .0274$). Reject H_0 . The sample data support the claim that the mean start-up costs in Idaho are lower than the national average.

13. A random sample of 68 adult coyotes showed that the average age was $\bar{x} = 2.05$ years. From past research the overall population mean age of adult coyotes is considered to be $\mu = 1.75$ with a standard deviation of $\sigma = .82$ years. Use a 0.01 significance level to determine whether the sample indicates that the mean age of coyotes is the same as the previously reported mean age. Use the P -value method. $H_0 : \mu = 1.75$; $H_1 : \mu \neq 1.75$; Test statistic: $z = 3.02$; P -value: 0.003. Reject H_0 . There is sufficient evidence to warrant rejection of the claim that the mean age of coyotes in Minnesota is the same as the previously reported mean age of 1.75 years.

14. (Assume that the sample is from a normally distributed population.) The times (in minutes) listed below are waiting times for customers at a bank where everyone waits in a single line that feeds three teller windows. Previously the bank had three waiting lines, one for each teller window. With the three waiting lines, the standard deviation of waiting times was 1.9 minutes. Use a significance level of 0.10 to test the claim that the single-waiting line has a smaller standard deviation. Does the single waiting line appear to reduce the variation in waiting times?

6.5 6.6 6.7 6.8 7.1 7.3 7.4 7.7 7.7 7.7

$H_0 : \sigma = 1.9$; $H_1 : \sigma < 1.9$; Test statistic: $\chi^2 = 0.566$; Critical Value: $\chi^2_{crit} = 4.168$. Reject H_0 . There is sufficient evidence to support the claim that the standard deviation is less than 1.9 minutes. Yes, the single line does appear to reduce variation.

15. A few years ago some professional baseball players complained that umpires were calling more strikes than the average rate of 61.0% called the previous year. A report showed that one umpire had called strikes in 2231 of 3581 pitches (based on data from USA Today). Use a 0.05 significance level to test the claim that this umpire has a strike rate greater than 61%. Use the P -value method. $H_0 : p = 0.61$; $H_1 : p > 0.61$; Test statistic: $z = 1.60$; P -value: 0.0548. Fail to reject H_0 .

There is not sufficient evidence to support the claim that the strike rate is greater than 61%.

16. Test the following claim using a significance level of $\alpha = 0.10$ and your choice of method. A newspaper reports that "3/4 of all adults use the Internet." A Pew Research Poll found that 73% of 3011 adults said that they did use the internet. Explain whether it is okay for the newspaper to make the claim above.

$H_0 : p = 0.75$; $H_1 : p \neq 0.75$; Test statistic: $z = -2.53$; $z_{crit} = -1.645$ and 1.645 ; or P -value = .011; Reject H_0 .

There is sufficient evidence to warrant rejection of the claim that 3/4 of all adults use the Internet. Since there is evidence to warrant rejection of this claim, the newspaper should not print it.