

1. The two intervals (114.4, 115.6) and (114.1, 115.9) are confidence intervals for  $\mu$  = true average resonance frequency (in hertz) for all tennis rackets of a certain type.

a. What is the value of the sample mean resonance frequency?  $\frac{114.4 + 115.6}{2} = 115$

b. The confidence level for one of these intervals is 90% and for the other it is 95%. Which is which, and how can you tell?

(114.4, 115.6) is the 90% CI and (114.1, 115.9) is the 95% CI because the higher the confidence level, the wider the CI.

2. Suppose that we check for clarity in a random sample of 50 locations in Lake Tahoe and discover that the average depth of clarity of the lake is 14 feet. Suppose that we know that the standard deviation for the entire lake's depth is 2 feet. What can we conclude about the average clarity of the lake with a 95% confidence level? (round to one decimal place)

$n = 50$   $\bar{x} = 14'$   $\sigma = 2'$   $E = 1.96 \cdot \frac{2}{\sqrt{50}} = 0.6$   
 $C = .95$   $\frac{1 - .95}{2} = .0250$   $14 - 0.6 < \mu < 14 + 0.6$   
 $Z_c = 1.96$   $13.4 < \mu < 14.6$

With 95% confidence, we can say the pop. mean depth of clarity in Lake Tahoe is between 13.4' and 14.6'.

3. You want to estimate the average hourly output of a machine to within  $\pm 1.5$ , with 90% confidence. Based on historical data, you have reason to believe that the standard deviation of the machine's hourly output is 6.2. How large a sample do you need?

$E = 1.5$   $C = .90$   $\sigma = 6.2$   
 $\frac{1 - .90}{2} = \frac{.1}{2} = .0500$   $n = \left( \frac{1.645 \cdot 6.2}{1.5} \right)^2 = 46.2...$   
 $Z_c = 1.645$   $n = 47$

4. A random sample of five students visiting the student health center for a free dental examination during the National Dental Hygiene Month were asked how many months had passed since their last visit to a dentist. Their responses were as follows:

6 17 11 22 29

a. Find the sample mean and sample standard deviation. (round to one decimal place)

$\bar{x} = 17$   $S = 9.0$

b. Construct and interpret a 95% confidence interval for the mean number of months elapsed since the last visit to a dentist for the population of students participating in the program. (round to one decimal place)

d.f = 4  $n = 5$   $E = 2.776 \cdot \frac{9}{\sqrt{5}} = 11.2$   $17 - 11.2 < \mu < 17 + 11.2$   
 $C = .95$   $t_c = 2.776$   $5.8 < \mu < 28.2$

With 95% confidence, we can say the pop. mean of elapsed time since last visit to the dentist is between 5.8 month and 28.2 months.

5. Find the critical value,  $Z_c$ , necessary to form a confidence interval at the given level of confidence.

(a)  $c = 0.80$   $\frac{1-.8}{2} = \frac{.2}{2} = .1000$   $Z_c = 1.28$

(b)  $c = 0.85$   $\frac{1-.85}{2} = \frac{.15}{2} = .075$   $Z_c = 1.44$

(c)  $c = 0.97$   $\frac{1-.97}{2} = \frac{.03}{2} = .0150$   $Z_c = 2.17$

7. Construct the indicated confidence interval for the population mean  $\mu$ . (round to two decimal places)

(a)  $c = 0.90$   $\bar{x} = 15.2$   $s = 2.0$   $n = 61$   $15.2 - .43 < \mu < 15.2 + .43$   
 $d.f. = 60$   $t_c = 1.671$   $E = 1.671 \cdot \frac{2}{\sqrt{61}} = .43$   $14.77 < \mu < 15.63$

(b)  $c = 0.95$   $\bar{x} = 31.39$   $s = 0.8$   $n = 82$   $31.39 - .18 < \mu < 31.39 + .18$   
 $d.f. = 81$   $t_c = 1.990$   $E = 1.990 \cdot \frac{0.8}{\sqrt{82}} = .18$   $31.21 < \mu < 31.57$

8. A biologist reports, a confidence interval of (2.1, 3.5) when estimating the mean height (cm) of a sample of seedlings. Find the estimated margin of error and the sample mean.

$\bar{X} = \frac{2.1+3.5}{2} = 2.8$   $E = 2.8 - 2.1 = 0.7$

9. You work for a consumer advocate agency and want to find the mean oil change cost. As part of your study, you randomly select 40 oil change costs and find the mean to be \$65.00. The sample standard deviation is \$10.50. Construct a 90% confidence interval for the population mean repair cost. (round to two decimal place)

$n = 40$   $\bar{x} = 65$   $s = 10.50$   $E = 1.685 \cdot \frac{10.50}{\sqrt{40}} = 2.80$   $65 - 2.80 < \mu < 65 + 2.80$   
 $c = .90$   $df = 39$   $t_c = 1.685$   $62.2 < \mu < 67.8$

With 90% confidence, we can say the pop. mean cost for an oil change is between \$62.20 and \$67.80.

10. **Internet Shopping** In a Gallop poll, 1025 randomly selected adults were surveyed and 29% of them said they used the Internet for shopping at least a few times a year. (round to three decimal place)

$\hat{p} = .29$   $\hat{q} = .71$

a. Find the point estimate  $\hat{p}$ , of the percentage of adults who use the Internet for shopping.

b. Find a 99% confidence interval estimate of the percentage of adults who use the Internet for shopping.

$\frac{1-.99}{2} = \frac{.01}{2} = .0050$   $E = 2.575 \sqrt{\frac{.29(.71)}{1025}} = .036$   $.29 - .036 < p < .29 + .036$   
 $Z_c = 2.575$   $.254 < p < .326$

With 99% confidence, the percent of adults who use the Internet for shopping is between 25.4% and 32.6%.