Math 153 - Quiz 10

December 1, 2016

Name key

Score _____

Show all work to receive full credit. Supply explanations when necessary.

1. (5 points) Metal rods are manufactured by a certain machine. From past experience, the population standard deviation of the rod diameters has been found to be $\sigma = 0.053$ in. Suppose you would like to find a 95% confidence interval estimate for the mean diameter of rods produced by the machine.

   (a) What size sample should you use to ensure a margin of error of less than 0.015 in?

   $\alpha = 0.05$

   $\alpha/2 = 0.025$

   $Z_{\alpha/2} = \text{invNorm}(0.975)$

   ≈ 1.960

   $$n = \left(\frac{(1.960)(0.053)}{(0.015)}\right)^2 \approx 47.96$$

   Use $n = 48$

   (b) A random sample of 50 rods gave a mean diameter of 1.42 in. Compute the corresponding 95% confidence interval estimate. Write a complete sentence that gives a valid interpretation of your interval.

   ZInterval w/ Stats

   $\sigma = 0.053$

   $\bar{x} = 1.42$

   $n = 50$

   C-Level $= 0.95$

   Interval is $(1.4053, 1.4347)$

   We are 95% confident that the mean rod diameter is between 1.405 and 1.434 inches.

   (c) What is the margin of error associated with your interval estimate? Does it agree with your result from part (a)?

   $E = 1.42 - 1.4053 = 0.0147$

   Yes, the sample size is more than 48, and our margin of error is less than 0.015 in.

2. (5 points) A tourist agency researcher would like to determine the proportion of U.S. adults who have ever vacationed in Mexico. The researcher would like to construct a 90% confidence interval estimate.

(a) What sample size should the researcher use to ensure a margin of error of less than 2%?

$\alpha = 0.10$

$\alpha/2 = 0.05$

$z_{\alpha/2} = \text{invNorm}(0.95)$

≈ 1.645

$$n = \frac{(1.645)^2 (0.25)}{(0.02)^2} \approx 1691.27$$

Use $n = 1692$

(b) The researcher found a poll that suggested that 10.4% of adults have vacationed in Mexcio. Does this information change your sample size? If so, to what?

$$n = \frac{(1.645)^2 (0.104)(0.896)}{(0.02)^2} \approx 630.40$$

Use $n = 631$

(c) The researcher selected 1500 U.S. adults at random and found that 8.2% had vacationed in Mexico. Find the corresponding 90% confidence interval estimate for the population proportion. Write a complete sentence that gives a valid interpretation of your interval.

1-PropZInt

$x = (0.082)(1500) = 123$

$n = 1500$

C-Level = 0.90

Interval is $(0.07035, 0.09365)$

We are 90% confident that the proportion of adults who have vacationed in Mexico is between 7.035% and 9.365%.

(d) Find the margin of error in your estimate.

$0.082 - 0.07035 = 0.01165$

$\approx 1.2\%$