Statistics 300
Quiz #11

Name: Solution

In these problems, you must provide the symbolic formula and the formula with the relevant values in place.

(8 points)

1. The average fat content of hamburgers at fast-food restaurants was studied by collecting a random sample of 9 hamburgers and determining the amount of fat in each one. Use the data from the study shown in the box below to make a 90% confidence interval for the mean fat content of the population of all hamburgers at fast-food restaurants. Experience shows that this population is bell-shaped.

Burger	Fat * Content
1	27.5
2	25.6
3	26.4
4	25.7
5	36.3
6	31.6
7	30.4
8	28.9
9	29.1

* in grams

$$90\%\ CI(\mu) = \bar{x} \pm t_{\alpha/2}\left(\frac{s}{\sqrt{n}}\right)$$

$$= 29.06 \pm 1.860\left(\frac{3.418}{\sqrt{9}}\right)$$

$$= 29.06 \pm 1.860(1.139)$$

$$= 29.06 \pm 2.12$$

$$[26.94 < \mu < 31.18]$$

$n = 9$

$\bar{x} = 29.06$

$s = 3.418$

$df = 8$

$\alpha = 1 - \text{confid}$

$0.10 = 1 - 0.90$ use $\alpha = 0.10$ in 2 tails $t = 1.860$

(7 points)

2. The average fat content of hamburgers at fast-food restaurants is being studied by collecting a random sample of hamburgers and determining the amount of fat in each one. Ten hamburgers have already been tested and the variance of the fat contents was 576 g^2. If the goal of this this research is to estimate the mean of the population of the fat contents of all hamburgers at fast-food restaurants with an accuracy of plus or minus 0.5 grams with 95% confidence, how many more hamburgers must be tested?

E $\hat{\sigma}^2$

$\hat{\sigma} = 24$

Sample size problem for estimating μ

$\alpha = 1 - \text{confidence}$
$= 1 - 0.95$
$= 0.05$
$\alpha/2 = 0.025$
$Z_{\alpha/2} = 1.96$

$$n = \left[\frac{Z_{\alpha/2} \cdot \hat{\sigma}}{E}\right]^2 = \left[\frac{(1.96)(24)}{0.5}\right]^2$$

$$= 8851.05 \uparrow 8852$$

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(8 points)

3. A random sample of 32 hamburgers from fast-food restaurants was collected and the fat content of each was determined. The sample average was 28.6 grams and the sample standard deviation was 5.92 grams. Use these results to construct a 90% confidence interval for the standard deviation of the population of the fat contents of all hamburgers from fast-food restaurants. (As you already know, the distribution fat contents is approximately bell-shaped.)

$$90\%\,CI(\sigma): \sqrt{\frac{(n-1)s^2}{\chi^2_R}} < \sigma < \sqrt{\frac{(n-1)s^2}{\chi^2_L}}$$

$n = 32$

$df = 31$ (use 30)

$\chi^2_L = 18.493$

$\chi^2_R = 43.773$

$s = 5.92$

$$\sqrt{\frac{(31)(5.92)^2}{43.773}} < \sigma < \sqrt{\frac{(31)(5.92)^2}{18.493}}$$

$$[\,4.98 < \sigma < 7.66\,]$$

Based on your confidence interval, is it reasonable to claim that the population standard deviation (σ) is less than 6 grams?

Yes   No   **Why?** Because values less than 6 are contained in the confidence interval.

Based on your confidence interval, is it reasonable to claim that the population standard deviation (σ) is more than 6 grams?

Yes   No   **Why?** Because values greater than 6 are contained in the confidence interval.