

A marketing executive at the GAP is interested in estimating the mean price of jeans so that the new line coming out in the fall is reasonable priced in comparison to other retail stores. Assume that a random sample of 144 pairs of jeans was examined. Based on this sample the mean price of jeans is \$47.50. Assume the population standard deviation is \$6.00. Use this information to answer the next four questions.

$$n = 144, \quad \bar{x} = 47.50 \quad \sigma = 6.00$$

1. What is the point estimate for the mean price of the jeans?

$$\bar{x} = \hat{\mu} = 47.50$$

2. What is the point estimate for the variance of the price of the jeans?

Although  $s^2$ , the sample variance estimates the population variance,  $\sigma^2$ , in this case that is not needed since  $\sigma$  is known, so  $\sigma^2 = (6.00)^2$ .  $\sigma^2$  is known here, not estimated.

3. What is the point estimate for the standard deviation for the price of the jeans?

Although  $s$  estimates population standard deviation,  $\sigma$ , in this case  $\sigma$  is not estimated, but is stated as known,  $\sigma = 6.00$ .

4. What is the standard error for the point estimate for the mean price of the jeans?

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{6.00}{\sqrt{144}} = .5$$

5. What is the 95% confidence interval to estimate the mean price of the jeans?

$$\begin{aligned} \bar{x} \pm z_{.05/2} \cdot \sigma_{\bar{x}} &= 47.50 \pm 1.96(.5) \\ \bar{x} \pm z_{.025} \frac{\sigma}{\sqrt{n}} &= 47.50 \pm .98 \\ &= (46.52, 48.48) \end{aligned}$$

$$47.50 \pm 1.96 \frac{6}{\sqrt{144}}$$

6. What is the numerical value of the bound of error for a 95% confidence interval to estimate the mean price of the jeans?

$$\text{Bound} = z_{.05/2} \sigma_{\bar{x}} = 1.96(.5) = .98$$

What is the relationship between B and the width of the interval?  
Width = 2 Bound

7. What is the 99% confidence interval to estimate the mean price of the jeans?

$$\begin{aligned} \bar{x} \pm z_{.01/2} \sigma_{\bar{x}} &= 47.50 \pm 2.576(.5) \\ \bar{x} \pm z_{.005} \frac{\sigma}{\sqrt{n}} &= 47.50 \pm 1.288 \\ &= (46.212, 48.788) \end{aligned}$$

8. What is the numerical value of the bound of error for a 99% confidence interval to estimate the mean price of the jeans?

The bound of error is the part of the confidence interval that is added and subtracted from the point estimate to construct the interval. The value of the Bound is,  $B = z_{.01/2} \sigma_{\bar{x}} = 2.576(.5) = 1.288$

Exercise One Lesson 13, Estimation of the Mean, page two

**College students carry more credit card debt** on average than they did one decade ago. A consumer credit organization is studying the debt of college students. They collected credit information from 900 college students across the US. This sample yielded a mean debt of \$2700. Assume the population standard deviation is \$300.

9. What is the point estimate for the mean credit card debt?

$$\bar{X} = \hat{M} = \$2,700.00$$

10. What is the point estimate for the variance of credit card debt?

See # 2.

11. What is the point estimate for the standard deviation for credit card debt?

See # 3.

12. What is the standard error for the point estimate for credit card debt?

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{300}{\sqrt{900}} = 10$$

13. What is the 90% confidence interval to estimate the mean credit card?

$$\begin{aligned} \bar{x} \pm z_{\frac{.10}{2}} \sigma_{\bar{x}} &= 2,700 \pm 1.645 (10) \\ \bar{x} \pm z_{.05} \frac{\sigma}{\sqrt{n}} &= 2,700 \pm 16.45 \\ 2,700 \pm 1.645 \frac{300}{\sqrt{900}} &= (2,683.55, 2,716.45) \end{aligned}$$

14. What is the numerical value of the bound of error for a 90% confidence interval to estimate the mean credit card debt?

$$\text{Bound} = z_{\frac{.10}{2}} \sigma_{\bar{x}} = z_{.05} \frac{\sigma}{\sqrt{n}} = 1.645 (10) = 16.45$$

} What is the relationship between B and the width of the interval?  $W = 2B$ .

15. What is the 98% confidence interval to estimate the mean credit card debt?

$$\begin{aligned} \bar{x} \pm z_{\frac{.02}{2}} \sigma_{\bar{x}} &= 2,700 \pm 23.26 \\ \bar{x} \pm z_{.01} \frac{\sigma}{\sqrt{n}} &= (2,676.74, 2,723.26) \\ 2,700 \pm 2.326 \frac{300}{\sqrt{900}} & \\ 2,700 \pm 2.326 (10) & \end{aligned}$$

16. What is the numerical value of the bound of error for a 98% confidence interval to estimate the mean credit card debt?

$$B = z_{\frac{.02}{2}} \sigma_{\bar{x}} = z_{.01} \frac{\sigma}{\sqrt{n}} = 2.326 (10) = 23.26$$