

5. Mini-Soccer Balls A soccer ball manufacturer wants to estimate the mean circumference of mini-soccer balls within 0.015 inch. Assume that the population of circumferences is normally distributed.

- (a) Determine the minimum sample size required to construct a 99% confidence interval for the population mean. Assume the population standard deviation is 0.20 inch.

$$n = \left(\frac{2.575 \cdot 0.20}{0.015} \right)^2 = 1179$$

- (b) Repeat part (a) using a standard deviation of 0.10 inch. Which standard deviation requires a larger sample size? Explain.

$$n = \left(\frac{2.575 \cdot 0.10}{0.015} \right)^2 = 295$$

Smaller standard deviation means smaller needed sample size.

- (c) Repeat part (a) using a confidence level of 95%. Which level of confidence requires a larger sample size? Explain.

$$n = \left(\frac{1.96 \cdot 0.20}{0.015} \right)^2 = 683$$

Lower confidence level means smaller needed sample size.

7. If all other quantities remain the same, how does the indicated change affect the minimum sample size requirement?

- (a) Increase in the level of confidence

Increases sample size

- (b) Increase in the error tolerance (margin of error)

Decreases sample size

- (c) Increase in the standard deviation

Increases sample size