

1) A company that produces light bulbs is concerned about the distribution of the life expectancy of the bulbs. The company takes a simple random sample of 81 bulbs and computes the sample mean to be 950 hours per bulb.

1. Population: All light bulbs produced by a company

2. Parameter: The average number of hours each bulb lasts.

3. Type of Interval: 1-Sample \bar{X}

a. Check the conditions to see if you can use a normal distribution?

$\sigma = 30$ $n = 81$ $\bar{X} = 950$

4. Conditions:

- * 1) Random Sample ✓
- * 2) $10n < \text{Pop. Size}$ ✓
- * 3) $n \geq 30$ (CLT)

b. Construct a 95% confidence interval for the unknown mean life expectancy assuming that the population standard deviation is 30 hours.

5. Formula / Interval: $\bar{X} \pm Z^* \left(\frac{\sigma}{\sqrt{n}} \right)$

6. Interpret: We are 95% confident that the avg. life expectancy of bulbs produced by the company is somewhere between 943.47 and 956.53 hours.

1) In a simple random sample of 100 students taken at a large university, 25 are English majors.

$$n = 100 \quad \hat{p} = \frac{25}{100} = .25$$

Construct and interpret an approximate 90%-confidence interval for the percent of students at the university who are English majors.

Conditions

1. Random Sample ✓
2. $10n < \text{Pop Size}$ ✓
3. $n\hat{p} \geq 10$ (yes) ✓
 $n(1-\hat{p}) \geq 10$ (no) ✓

Population: All students at a university

Parameter: the proportion of students who are English majors.

Type of Interval: 1 - Proportion Interval

Formula / Interval: $\hat{p} \pm Z^* \left(\sqrt{\frac{\hat{p}(1-\hat{p})}{n}} \right)$

SE \hat{p} $\approx .0433$

(.1788, .3212)

⊗ We are 90% confident that the actual proportion of students at the university who are English majors is somewhere between .1788 & .3212.

1) Using the formula for margin of error () if you wanted to have a margin of error less than 10% using a 95% confidence interval (Z-score of 1.96) and the standard deviation of the population was 20, what would be the smallest sample size that you could take?

$$CI = \text{Statistic} \pm (\text{critical value}) (\text{SD of statistic})$$

ME

10% = .10

$$\text{ME} = \text{C.V.} \left(\frac{\text{SD}}{\sqrt{n}} \right)$$

$$\sqrt{n} > \left[\frac{20}{(1.96)} \right]^2$$

$$n > 153,664$$

$$\sqrt{n} \cdot \left(\frac{.1}{1.96} \right) > \frac{20}{\sqrt{n}} \cdot \sqrt{n}$$

$$\left(\frac{.1}{1.96} \right) > \frac{20}{(1.96)}$$

$$\frac{20}{.0510204} = 392$$

$$ME = (C.V)(SD \text{ of Statistic})$$

$$(ME) = (Z^*) \left(\downarrow \right)$$

⊛ Standard deviation is never given when we have proportions.

prop.

$$\sqrt{\frac{p(1-p)}{n}}$$

mean

$$\frac{\sigma}{\sqrt{n}}$$

1) The actual time it takes to cook a 25 pound turkey is a normal random variable with a mean of 5.4 hours and a standard deviation of 0.7 hours.

a) Given that an average of 5.1 hours was found for a sample of 50 turkeys, calculate and interpret a 90% confidence interval for the average cooking time of a 25 pound turkey.

b) Is the parameter that you are trying to estimate in (b) actually in the interval? What is the parameter?

parameter
 $\mu = 5.4$ ~~⊗~~

$$n = 50$$
$$\bar{X} = 5.1$$
$$\mu = 5.4$$
$$\sigma = .7$$
$$* (4.937, 5.263) \quad [5.4]$$

We are 90% confident that the average cooking time for a 25 pound turkey is somewhere between 4.937 & 5.263 hours.