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1. What proportion p of U.S. high school students smoke? The 2007 Youth Risk Behavioral Survey questioned a random sample of 14,041 students in grades 9 to 12. Of these, 2808 said they had smoked cigarettes at least one day in the past month.

The best point estimate is $p = \frac{2808}{14041} \approx 0.20$ or $p = 20\%$

2. The 96% confidence interval for the true proportion of all 17 year old boys who own a used car with a sample size of 426 is (0.189, 0.251). Interpret this confidence interval.

We are 96% confident that the interval from 0.189 to 0.251 actually does contain the true value of the population proportion of all 17 year old boys who own a used car.

3. Find the appropriate critical value for the given confidence level.

a) 99.9% b) 95% c) 90% d) 92% e) 84% f) 78%

a) 3.2905 b) 1.9600 c) 1.6449 d) 1.7507 e) 1.4051 f) 1.2265

4. Assume that a simple random sample is used to estimate a population proportion p. Find the margin of error, E, that corresponds to the given statistics and confidence level. Round the margin of error to four decimal places.

a) 95% confidence, sample size is 600, of 32% are successes.

$$E = z_{\frac{\alpha}{2}}\sqrt{\frac{pq}{n}} = 1.96\sqrt{\frac{0.32*0.68}{600}} = 0.0373$$

b) 98% confidence, sample size is 18, of 24% are successes.

$$E = z_{\frac{\alpha}{2}}\sqrt{\frac{pq}{n}} = 2.3263\sqrt{\frac{0.24*0.76}{18}} = 0.2342$$

5. Use the given confidence level and sample data information to construct a confidence interval for the population proportion p.

n = sample size, x = number of successes

a) $n = 741$, $x = 274$; 95% confidence

$$x = 274 > 5,\ \ n - x = 741 - 274 = 467 > 5,\ \ n = 741,\ \ \alpha = 0.05,\ \ z_{\alpha/2} = z_{0.025} = 1.96$$

$$E = z_{0.025}\sqrt{\frac{\hat{p}\hat{q}}{n}} = 1.96\sqrt{\frac{274/741*467/741}{741}} \approx 0.0348$$

95% C. I. is (0.3350, 0.4045)

b) $n = 267$, $x = 194$; 88% confidence

$$x = 194 > 5,\ \ n - x = 267 - 194 = 73 > 5,\ \ n = 267,\ \ \alpha = 0.12,\ \ z_{\alpha/2} = z_{0.06} = 1.5548$$

$$E = z_{0.6}\sqrt{\frac{\hat{p}\hat{q}}{n}} = 1.5548\sqrt{\frac{194/267*73/267}{267}} \approx 0.0424$$

88% C. I. is (0.6842, 0.7690)

6. The Internet is affecting us all in many different ways, so there are many reasons for estimating the proportion of adults who use it. Assume that a manager for E-Bay wants to determine the current percentage of U.S. adults who now use the Internet. How many adults must be surveyed in order to be 98% confident that the sample percentage is in error by no more than three percentage points?

a) In 2012, 82% of adults used the Internet.

$$p = 0.82, \quad q = 0.18, \quad \alpha = 0.02, \quad z_{\alpha/2} = 2.3263, \quad E = 0.03$$

$$n = \frac{(z_{\alpha/2})^2 pq}{E^2} = \frac{(2.3263)^2 * 0.82 * 0.18}{0.03^2} \approx 887.55 \approx 888$$

b) Not known any possible value of the proportion.

$$\alpha = 0.02, \quad z_{\alpha/2} = 2.3263, \quad E = 0.03$$

$$n = \frac{(z_{\alpha/2})^2 0.25}{E^2} = \frac{(2.3263)^2 * 0.25}{0.03^2} \approx 1503.30 \approx 1504$$

7. Use the given data to find the sample size required to estimate the population proportion.

a) Margin of error: 0.006; confidence level: 90%; $\hat{p}$ and $\hat{q}$ unknown.

$$\alpha = 0.10, \quad z_{\alpha/2} = 1.6449, \quad E = 0.006$$

$$n = \frac{(z_{\alpha/2})^2 0.25}{E^2} = \frac{(1.6449)^2 * 0.25}{0.006^2} \approx 18788.50 \approx 18789$$

b) Margin of error: 0.02; confidence level: 94%; $\hat{p}$ and $\hat{q}$ unknown.

$$\alpha = 0.06, \quad z_{\alpha/2} = 1.8808, \quad E = 0.02$$

$$n = \frac{(z_{\alpha/2})^2 0.25}{E^2} = \frac{(1.8808)^2 * 0.25}{0.02^2} \approx 2210.87 \approx 2211$$

8. Use the given data to find the sample size required to estimated the population proportion.

a) Margin of error: 0.08; confidence level: 96%; from a prior study, $\hat{p}$ is estimated by 0.24.

$$p = 0.24, \quad q = 0.76, \quad \alpha = 0.04, \quad z_{\alpha/2} = 2.0537, \quad E = 0.08$$

$$n = \frac{(z_{\alpha/2})^2 pq}{E^2} = \frac{(2.0537)^2 * 0.24 * 0.76}{0.08^2} \approx 120.21 \approx 121$$

b) Margin of error: 0.004; confidence level: 92%; from a prior study, $\hat{p}$ is estimated by 0.123.

$$p = 0.123, \quad q = 0.877, \quad \alpha = 0.08, \quad z_{\alpha/2} = 1.7507, \quad E = 0.004$$

$$n = \frac{(z_{\alpha/2})^2 pq}{E^2} = \frac{(1.7507)^2 * 0.123 * 0.877}{0.004^2} \approx 20663.38 \approx 20664$$

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9. The Genetics and IVF Institute conducted a clinical trial of the XSORT method designed to increase the probability of conceiving a girl. As of this writing, 574 babies were born to parents using the XSORT method, and 525 of them were girls.

a) What is the best point estimate of the population proportion of girls born to parents using the XSORT method?

The best point estimate is $p = \frac{525}{574} \approx 0.9146$

b) Use the sample data to construct a 95% confidence interval estimate of the percentage of girls born to parents using the XSORT method.

Requiremnt check: SRS, Binomial, $n = 574$, $x = 525 \geq 5$, $n - x = 49 \geq 5$

$p = \frac{525}{574}, \quad q = \frac{49}{574}$

$E = z_{\frac{\alpha}{2}}\sqrt{\frac{pq}{n}} = 1.96\sqrt{\frac{525/574 * 49/574}{574}} \approx 0.0229$

95%CI: (0.8918, 0.9375)

10. The following confidence interval is obtained for a population proportion, *p*: (0.426, 0.612). Use these confidence interval limits to find the point estimate, $\hat{p}$ and margin of error *E*.

$p = \frac{0.612 + 0.426}{2} = 0.519, \qquad E = \frac{0.612 - 0.426}{2} = 0.093$

11. A company that produces white bread is concerned about the distribution of the amount of sodium in its bread. The company takes a simple random sample of 100 slices of bread and computes the sample mean to be 103 milligrams of sodium per slice. Construct a 99% confidence interval for the unknown mean sodium level assuming that the population standard deviation is 10 milligrams.

SRS, $\sigma = 10$, $n = 100 > 30$, $\bar{x} = 103$, ZInterval $\rightarrow$ (100.42, 105.58)

12. You work for a consumer advocate agency and want to find the mean repair cost of a washing machine. In the past, the standard deviation of the cost of repairs for washing machines has been $17.50. As part of your study, you randomly select 40 repair costs and find the mean to be $100.00. Calculate a 90% confidence margin of error and confidence interval for the population mean.

Consumer Agency $\rightarrow$ SRS, $\sigma = 17.5$, $n = 40 > 30$, $\bar{x} = 100$,

$E = z_{\alpha/2}\frac{\sigma}{\sqrt{n}} = 1.6449 \bullet \frac{17.5}{\sqrt{40}} = 4.5513$ ZInterval $\rightarrow$ (95.45, 104.55)

~~**13.** The actual time it takes to cook a ten pound turkey is a normally distributed. Suppose that a simple random sample of 19 ten pound turkeys is taken. Given that an average of 2.9 hours and a standard deviation of .24 hours was found for a sample of 19 turkeys, calculate a 96% confidence margin of error and confidence interval for the average cooking time of a ten pound turkey.~~

SRS, ND, $n = 19$, $\bar{x} = 2.9$, $s = 0.24$,

$E = t_{\alpha/2}\frac{s}{\sqrt{n}} = 2.2137 \bullet \frac{0.24}{\sqrt{19}} = 0.1219$

TInterval $\rightarrow$ (2.7781, 3.0219)

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14. ~~The football coach randomly selected eight players and timed how long it took to perform a certain drill. The times in minutes were:~~

~~10~~	~~6~~	~~8~~	~~7~~
~~6~~	~~5~~	~~7~~	~~8~~

~~Assuming that the times follow a normal distribution, find a 92% confidence interval for the population mean.~~

(1) No information points to SRS, requirements does not meet. Can not do.

(2) If the coach conducts a SRS, then ND, $n = 8$, TInterval $\rightarrow$ Data $\rightarrow$ (6.0019, 8.2481)