HW 8.2 Part B pages 496-497 problems 35, 36, 37, 41, 43, 47

(35) a) **STATE: State the parameter you want to estimate and the confidence level.**

Estimate the true proportion p of U.S. college students who are classified as abstainers at a 99% confidence level.

Statistic: $\hat{p} = \frac{2105}{10,904} \approx .193$

PLAN: Identify the appropriate inference method and check conditions.

Name of procedure: One sample z interval for p.

Check conditions:

① Random: yes, 10904 students selected randomly. ✓

② 10% (Independent) Condition
yes, reasonable to assume the population of all U.S. college students ≥ 10(10,904)

③ Normal Condition (Large Counts)

$n(\hat{p}) \geq 10$ — # of successes

$10,904\left(\frac{2105}{10,904}\right) \geq 10$ ✓

$n(1-\hat{p}) \geq 10$ — # of failures

$10,904\left(\frac{8799}{10,904}\right) \geq 10$ ✓

DO: If the conditions are met, perform the calculations.

General Formula: Point Estimate ± M.O.E

Specific Formula: $\hat{p} \pm z^* \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$

Work:

$z^* = \text{invnorm}\left(\frac{1-.99}{2}\right) = 2.576$

$.193 \pm 2.576\sqrt{\frac{.193(.807)}{10,904}}$

$.193 \pm .0097$

Answer: (.1833, .2027)

CONCLUDE: Interpret your interval in the context of the problem.

Interpret:

We are 99% confident that the interval from .1833 to .2027 captures the true proportion of U.S. College Students who are abstainers.

b) The value of 25% does not appear in our 99% confidence interval, so it would be very surprising (or unlikely) if the claim was correct.

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a) **STATE:** State the parameter you want to estimate and the confidence level.

Estimate the true proportion p of American teens (12 to 17) that have online profiles with photos of themselves at a 95% confidence level.

Statistic: $\hat{p} = \frac{385}{487} \approx .791$

PLAN: Identify the appropriate inference method and check conditions.

Name of procedure: One sample z interval for p

Check conditions:

① Random: yes, 487 teens selected randomly

② 10% (Independent) Condition
$10(487) <$ pop. of US teens
reasonable to assume

③ Normal Condition
Large Counts
$n(\hat{p}) \geq 10$
$385 \geq 10$
successes

$n(1-\hat{p}) \geq 10$
$102 \geq 10$
failures

DO: If the conditions are met, perform the calculations.

General Formula: Point Estimate ± M.O.E

Specific Formula: $\hat{p} \pm z^* \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$

Work: $z^* = \text{invNorm}\left(\frac{1-.95}{2}\right) = 1.960$

$.791 \pm 1.96\sqrt{\frac{(.791)(.209)}{487}}$

$.791 \pm .036$

Answer: $(.755, .827)$

CONCLUDE: Interpret your interval in the context of the problem.

Interpret: We are 95% confident that the interval from .755 to .827 captures the true proportion of teens that have online profiles with photos of themselves.

b) The value of 75% does not appear in our 95% confidence interval, so it would be very surprising if the true proportion is 0.75.

(37) Possible source of error is whether or not students told the truth in the survey.

(38) Possible source of error is undercoverage and/or nonresponse

(41) a) The station's quoted 1.6% M.O.E. is not correct They should not calculate M.O.E b/c the Random condition was not met. (Survey was through a call in poll, so sample was voluntary)

b) No, this was a voluntary response sample, so no inference should be made about any population.

(43) a) $\hat{p} = 0.75$ 90% confidence

M.O.E = .04 $z^* = \text{invNorm}\left(\frac{1.90}{2}\right) = 1.645$

$$ME \geq z^*\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

$$.04 \geq 1.645\sqrt{\frac{(.75)(.25)}{n}}$$

$$\left(\frac{.04}{1.645}\right)^2 \geq \left(\frac{\sqrt{.1875}}{\sqrt{n}}\right)^2$$

Do not round → $\left(\frac{.04}{1.645}\right)^2 \geq \frac{.1875}{n}$

$$n \geq \frac{.1875}{(.04/1.645)^2}$$

$n \geq 317.11$

$\boxed{n = 318 \text{ people}}$

43) b) conservative $\hat{p} = .05$ $ME = .04$ $z^* = 1.645$

$.04 \geq 1.645\sqrt{\frac{(.5)(.5)}{n}}$

$\frac{.04}{1.645} \geq \sqrt{.25/n}$

Do not round → $\left(\frac{.04}{1.645}\right)^2 \geq \frac{.25}{n}$

$n \geq .25/\left(\frac{.04}{1.645}\right)^2$

$n \geq 422.8$

$n \geq 423$ people (423-318

The sample sizes differ by 105 people.

$ME = z^*\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$

47) a) $.03 = z^*\sqrt{\frac{(.64)(.36)}{1028}}$

$z^* = \frac{.03}{\sqrt{\frac{.2304}{1028}}} = 2.004$

within 2 S.D.

need to show work!

$\boxed{\text{so 95\% confidence level}}$

b) A practical difficulty could be nonresponse bias.

44) a) $\hat{p} = .44$ $ME = .03$ $z^* = \text{invNorm}\left(\frac{1-.99}{2}\right) = 2.576$

$.03 \geq 2.576\sqrt{\frac{(.44)(.56)}{n}}$

$\frac{.03}{2.576} \geq \sqrt{\frac{.2464}{n}}$

$\left(\frac{.03}{2.576}\right)^2 \geq \frac{.2464}{n}$

$n \geq \frac{.2464}{(.03/2.576)^2}$

$n \geq 1816.7$

$\boxed{n \geq 1{,}817 \text{ people}}$

b) $\hat{p} = 0.5$

$.03 \geq 2.576\sqrt{\frac{(.5)(.5)}{n}}$

$\left(\frac{.03}{2.576}\right)^2 \geq \frac{.25}{n}$

$n \geq \frac{.25}{\left(\frac{.03}{2.576}\right)^2}$

$n \geq 1843.3$

$\boxed{n \geq 1844 \text{ people}}$

$\boxed{\text{The sample sizes differ by 27}}$