

12.10

We must find the sample size, n , such that

$$1.645 \sqrt{\frac{(0.7)(0.3)}{n}} \leq 0.04$$

$$\frac{(0.7)(0.3)}{\left(\frac{0.04}{1.645}\right)^2} \leq n$$

So the desired sample size is 356.

If 50% responds favorably, the margin of error of the 90% confidence interval is

$$1.645 \sqrt{\frac{(0.5)(0.5)}{356}} = 0.0429$$

12.12

We must find the sample size, n , such that

$$1.96 \sqrt{\frac{(0.75)(0.25)}{n}} \leq 0.04$$

$$\frac{(0.75)(0.25)}{\left(\frac{0.04}{1.96}\right)^2} \leq n$$

So the desired sample size is 451.

12.18

$$(a) \quad 2.5758 \sqrt{\frac{(0.2)(0.8)}{n}} \leq 0.015$$

$$n \geq 4718.148$$

So the required sample size is 4719.

(b) The TI-84 99% C.I. is (0.08877, 0.11127), so the margin of error is 0.01127, which is well within the required margin of error from part (a).

12.30

(a) We will test whether p_1 , the proportion of urban/suburban students who succeed in the chemical engineering course is different from p_2 , the proportion of rural students who succeed.

$$H_0: p_1 = p_2$$

$$H_A: p_1 \neq p_2$$

- We are not told that our sample was random, and if it was not, we cannot trust the results of this test.
- It is reasonable to assume that $65 < 0.1$ (All urban/suburban students) and that $52 < 0.1$ (All rural students).
- $52 > 5$, $13 > 5$, $30 > 5$, and $25 > 5$, so all counts of successes and failures are greater than 5.

The TI-84 2-PropZTest: $z = 2.986$, $p\text{-value} = 0.0028$. This low p -value gives strong evidence against the null hypothesis.

There is strong statistical evidence that the proportion of urban/suburban students who succeed in this chemical engineering course is different from the proportion of rural students who succeed.

(b) The 90% confidence interval for $p_1 - p_2$ is (0.11723, 0.39186). We are 90% confident that the difference between the proportion of successful urban/suburban students and the proportion of successful rural students is in this interval.

12.38

We will test whether there is a difference between p_1 , the proportion of food and drink businesses in central Indiana headed by men that fail, and p_2 , the proportion of these businesses headed by women that fail.

$$H_0: p_1 - p_2 = 0 \text{ vs. } H_a: p_1 - p_2 \neq 0$$

Assuming all conditions held from the previous exercise and noting that

$$n_1 \hat{p}_1 = 15 > 5$$

$$n_1 \hat{q}_1 = 91 > 5$$

$$n_2 \hat{p}_2 = 7 > 5 \quad \text{we proceed with our 2-prop z test: } z = -0.387, p\text{-val} = 0.698.$$

$$n_2 \hat{q}_2 = 35 > 5$$

This very high p -value indicates that we do not have significant evidence against H_0 . That is, we do not have statistically significant evidence to support the claim that there is a difference in the proportion of food and drink businesses headed by men and the proportion of those headed by women that fail.

12.42

Since the station did not obtain an SRS, any inference procedures or conclusions drawn from them are completely invalid.