smartphones. Of the 500 people surveyed, 421 responded yes - they own smartphones. Using a 95% confidence level, compute a confidence interval estimate for the true proportion of adult residents of this city who have smartphones.

Solution

- · The first solution is step-by-step.
- The second solution uses a function of the TI-83, 83+ or 84 calculators.

Let X = the number of people in the sample who have cell phones. X is binomial. $X \sim B\left(500, \frac{421}{500}\right)$.

To calculate the confidence interval, you must find p', q', and EBP.

$$n = 500$$

x = the number of successes = 421

$$p' = \frac{x}{n} = \frac{421}{500} = 0.842$$

p' = 0.842 is the sample proportion; this is the point estimate of the population proportion.

$$q' = 1 - p' = 1 - 0.842 = 0.158$$

Since *CL* = 0.95, then α = 1 – *CL* = 1 – 0.95 = 0.05 $\left(\frac{\alpha}{2}\right)$ = 0.025.

Then
$$z_{\frac{\alpha}{2}} = z_{0.025} = 1.96$$

Use the TI-83, 83+, or 84+ calculator command invNorm(0.975,0,1) to find z_{0.025}. Remember that the area to the right of $z_{0.025}$ is 0.025 and the area to the left of $z_{0.025}$ is 0.975. This can also be found using appropriate commands on other calculators, using a computer, or using a Standard Normal probability table.

$$EBP = \left(z_{\frac{\alpha}{2}}\right)\sqrt{\frac{p'q'}{n}} = (1.96)\sqrt{\frac{(0.842)(0.158)}{500}} = 0.032$$

$$p' - EBP = 0.842 - 0.032 = 0.81$$

$$p' + EBP = 0.842 + 0.032 = 0.874$$

The confidence interval for the true binomial population proportion is (p' - EBP, p' + EBP) = (0.810, 0.874).

Interpretation: We estimate with 95% confidence that between 81% and 87.4% of all adult residents of this city have smartphones.

Explanation of 95% Confidence Level: Ninety-five percent of the confidence intervals constructed in this way would contain the true value for the population proportion of all adult residents of this city who have smartphones.

⊘ Solution



USING THE TI-83, 83+, 84, 84+ CALCULATOR

Press STAT and arrow over to TESTS.

Arrow down to A:1-PropZint. Press ENTER.

Arrow down to x and enter 421.

Arrow down to n and enter 500.

Arrow down to C-Level and enter .95.

Arrow down to Calculate and press ENTER.

The confidence interval is (0.81003, 0.87397).



TRY IT 8.10

Suppose 250 randomly selected people are surveyed to determine if they own a tablet. Of the 250 surveyed, 98 reported owning a tablet. Using a 95% confidence level, compute a confidence interval estimate for the true